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Effects of Crab/Lobster Traps on Seagrass Beds of the Florida Keys National Marine Sanctuary (FKNMS): Damage Assessment and Evaluation of Recovery

Progress Report #1

September 14, 2001

In cooperation with
the Monroe County Commercial Fishermen Incorporated (MCCF)
and the FKNMS

Submitted By:

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INTRODUCTION

In Florida, the commercial spiny lobster fishery is located predominantly in Monroe County, which encompasses the Florida Keys. For the 2000-2001 season, 542,936 traps were reported to be actively fished in Monroe County (T. Matthews, FMRI, pers. com.). A large portion of these traps are fished in seagrass beds (T. Matthews, FMRI, pers. Comm.; pers. obs.). To our knowledge, there are no studies quantifying the effects of traps on seagrass. Seagrass beds are highly productive and function as habitats, nurseries, feeding grounds, settlement sites, and refuge areas for a large number of ecologically and commercially important marine organisms (Zieman, 1982; Phillips, 1984; Thayer et al., 1984; Zieman and Zieman, 1989; Gotceitas et al., 1997).

Because fishing practices vary to some unknown extent among fishermen, the possibility exists for traps to eventually have a negative impact on the seagrass where they are placed. If there were to be some critical period of time beyond which a trap left in place would negatively impact the seagrass, knowledge of this time frame could be used to help guide commercial fishermen towards minimizing habitat damage in the course of fishing. If there were no particularly adverse effects detected within the range of normal fishing practices, this would prevent unnecessary regulation of fishing practices out of concern for seagrass habitat damage.

It is generally agreed that traps that are lost or abandoned on the seafloor for extended periods have been observed to denude the habitat beneath them (G. DiDomenico, MCCF, pers. comm.) and sometimes produce a “halo” effect of bare substrate surrounding the trap (T. Matthews, FMRI, pers. comm.). Large numbers of traps can be lost during major storm events. After Hurricane Georges and Tropical Storm Mitch passed through the Florida Keys in 1998, fishermen reported an estimated 111,000 lost traps (T. Matthews, FMRI, pers. comm.). Additionally, during non-storm event seasons, approximately 118,000 traps are lost (T. Matthews, FMRI, pers. comm.). Quantification of the trajectory of trap-induced injury to seagrasses would help guide emergency response actions so that in the event of an extreme event, managers would know that it was important to recover traps within a certain time, beyond which significant habitat injuries would occur. Given that lobster traps have a benthic footprint of approximately 0.557 m^2, the aforementioned storm - induced trap losses creates the potential for ~66,000 m^2 of injured seagrass (and potentially other seafloor communities), excluding injuries associated with halo formation or the ground tackle (lines and buoys). Similar injuries may result from the regularly lost gear as well.

The presence of a substantial lobster fishery in Monroe County makes it a prime study area for the effects of these types of stationary gear. The goals of this project are to determine the degree of injury, if any, inflicted by spiny lobster traps on seagrass beds as a function of the duration of deployment and habitat type in which they have been placed. In addition, we will document the recovery trajectory of any injuries after traps have been removed. As with other injury assessment procedures in the FKNMS, documentation of the recovery horizon is critical so as to allow an assessment of lost interim resource services (Fonseca et al. 2000) and thus, an objective computation of any resource damage.

EXPERIMENTAL DESIGN

In late August 2001, researchers from CCFHRB traveled to Marathon in the Florida Keys to initiate the study. Three study sites were established in Monroe County, Florida, near Marathon (Figure 1). Two sites consisted of monospecific *Thalassia testudinum* and the third, *Syringodium filiforme*. The two *T. testudinum* sites were selected to have either firm, sand sediment or soft, silty sediments. Sufficient *S. filiforme* with firm sand sediments could not be readily located, therefore, only one *S. filiforme* treatment was established and that was in the typically encountered soft silty sediment. Sediment firmness was considered to be a factor in the severity of any injury (e.g., traps may compress seagrasses into softer as opposed to firmer sediment).

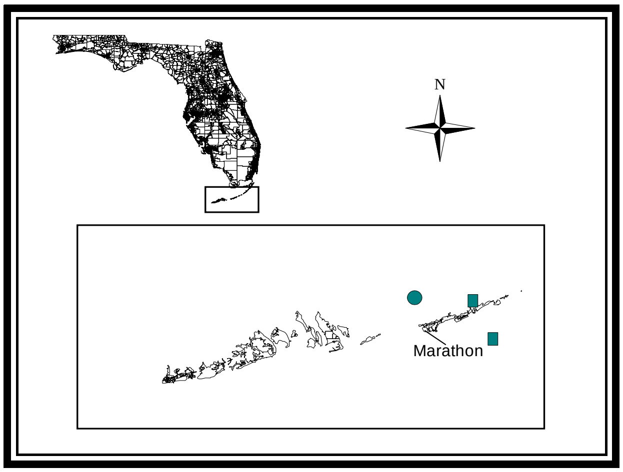

Figure 1. Approximate site locations in Monroe County, Florida. Circle* = Syringodium filiforme *site; squares* = Thalassia testudinum *sites.

CON	4 wks	6 wks	2 wks	CON	6 mos
1 wk	6 wks	6 mos	CON	2 wks	CON
2 wks	1 wk	CON	2 wks	4 wks	6 wks
4 wks	4 wks	1 wk	2 wks	6 wks	1 wk
6 mos	4 wks	6 mos	6 mos	1 wk	6 wks

15m

18m

Figure 2. Experimental design showing duration times for trap deployment.

Within each site, a 15m x 18m grid was established, with 30 subdivisions of 3m x 3m squares (Figure 2). Each 9 m^2 square was randomly assigned a treatment. There were six treatments (soak times) that represent the amount of time a trap will be left in place: 1) one week, 2) two weeks, 3) four weeks, 4) six weeks, 5) 6 months

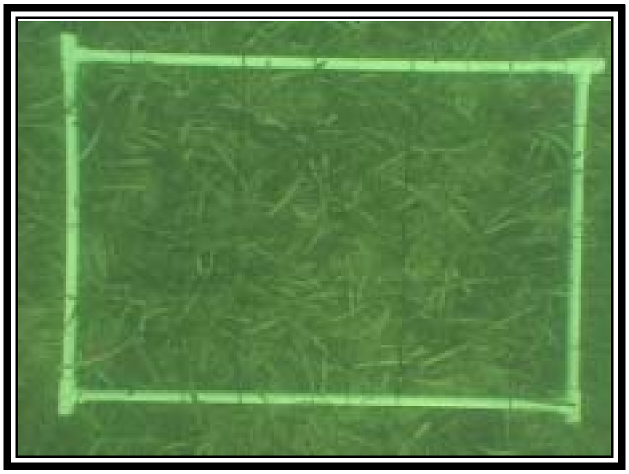

Figure 3. Braun-blanquet quadrat used for injury assessment; size matches dimensions of the trap gear (~ 0.6 x 0.9 m).

Figure 4. Loading traps on board for deployment at study site.

and 6) control – no trap. Five replicate traps will be removed at each sample time from each site. Prior to deployment of the trap, seagrass within each square of the grid was thoroughly surveyed: a 0.61 ’ x 0.91 m PVC quadrat (same dimension as the trap) was centered within each square and the area falling within the quadrat was assigned a Braun-Blanquet value (Fonseca et al. 1998) (Figure 3). In addition to the Braun-Blanquet survey, the quadrat was divided into 54, 10cm x 10cm squares and presence/absence of seagrass shoots was recorded from these 54 squares to yield a more precise spatial delineation of any injury within the area occupied by the trap. Additionally, three random shoot counts, sediment penetration measurements (kg cm^{-2}, and sediment shear (kg cm^{-2}) measurements were made from within the main quadrat to determine the firmness of the sediment. Finally, a still digital photograph encompassing the area of each Braun-Blanquet quadrat was taken. With the assistance of members of Monroe County Commercial Fishermen, Inc., 25 authentic spiny lobster traps (tops removed) were deployed at each site (Figures 4 & 5). Traps were centered within squares by divers using lift bags (Figure 6), with five squares acting as controls (no trap). Traps were placed in the exact location (quadrat) where pre-deployment survey data had been taken.

The retrieval and monitoring portion of the study will be conducted by SCUBA divers trained in the assessment techniques, under contract to CCFHRB. When a set of five replicate traps is removed after the treatment time has been reached, measurement of the aforementioned parameters will be repeated in the area falling directly beneath the trap (quadrat). The same measurements will be repeated in control treatment quadrats each survey time as well. After the last

Figure 5. Deployment of traps at study site.

traps are removed from each treatment, monitoring will occur at fixed intervals (time since treatment termination) until 100% recovery is attained or resources are exhausted.

The experiment will be treated as a repeated measures ANOVA. The following three main effect hypotheses will be tested; there is no difference in injury to seagrass (cover and density): 1) among treatments (soak times); 2) among seagrass species, and 3) among levels of substrate compaction. Four interaction hypotheses will be investigated; there is no difference in injury to seagrass among seagrass species: 1) in different substrate compaction, 2) among seagrass species under different soak times, 3) among substrate compaction at different soak times, and 4) among seagrass species in different levels of substrate compaction. We will plot the spatial pattern of recovery within the quadrat and visually examine these data to determine if there is any asymmetry in both the injury and the recolonization pattern that might help explain differences in overall recovery trajectory.

Figure 6. CCFHRB diver positioning trap on randomly assigned treatment at a* Thalassia testudinum *site.

EXPECTATIONS

The goal of this project is to ascertain the threshold soak time beyond which seagrasses exhibit significant levels of sustained injury and to establish the recovery trajectory for said injuries. We expect that longer soak times increase the chance of sustaining injury. In addition, recovery of injuries will depend upon the extent of injury (i.e., Braun-Blanquet values and shoot density counts).

TIMELINE

September 4, 2001.................traps deployed at three study sites

September 5, 2001.................traps arranged by divers
September 12, 2001...............trap retrieval after one week soak time
September 19, 2001...............trap retrieval after two week soak time
October 3, 2001......................trap retrieval after four week soak time
October 17, 2001....................trap retrieval after six week soak time
February 20, 2002...................trap retrieval after six month soak time

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